

COUNTY OF YORK

MEMORANDUM

DATE: April 4, 2000

TO: York County Planning Commission

FROM: Michael S. King, AICP, Planner

SUBJECT: Zoning Ordinance Review - Lighting Ordinance

Introduction

Light pollution is becoming an ever-increasing problem in the United States as our population and development continues to expand. Fortunately, most communities today are realizing that light pollution - which traditionally has often been overlooked - can be a negative by-product of growth. For York County, light pollution has been the undesirable side effect of the County's continual transformation into a fully developed community. The County hasn't had a reason to be concerned about it before. Why then is light pollution more noticeable now? Light pollution is more noticeable because development is more noticeable. This has been especially true with regard to some retail operations in the County (gas stations/convenience stores are the first that come to mind), although businesses are not the only offenders when it comes to light pollution. Unfortunately, light pollution has been generally overlooked because such items as air and water pollution have attracted more attention from the public. Light pollution, however, wastes energy¹, infringes on other people's property rights creating nuisances, adversely affects the environment, clutters the urban sky glow, and, because of misdirected light and glare, actually *reduces* safety in and around the lighted area². In fact, just recently a member of the County's Transportation Safety Commission noted during one of their regular meetings that the unshielded lights overflowing from the 7-11 located in front of Edgehill impedes the visibility of the traffic signal at Cook Road and Route 17. As you can see,

1 According to the National Academy of Sciences, the light that obscures our view of the night sky comes mainly from inefficient light sources that do little to increase nighttime safety, utility or security. The unfocused light produces glare and clutter and is costing more than \$1 billion annually in wasted energy. According to the EPA (Environmental Protection Agency), lighting accounts for 20-25% of the electricity used in the United States. 80-90% of this is used for industry, stores, offices, and warehouses. 20-30% of this is lost light that blocks our view of the sky, but does nothing to increase safety.

If energy-efficient lighting were used everywhere profitable, EPA projections show:

- a 50% reduction in electricity demanded
- reduced carbon dioxide emissions of 232 tons (or 42 million cars)
- reduced sulfur dioxide emissions by 1.7 million tons
- reduced nitrogen oxide emissions by 1 million tons

2 International Dark-Sky Association, Tuscon, AZ: "Light Pollution: The Problem, The Solutions" No. 134 February, 1998

light pollution can have many negative impacts on adjacent properties, including roadway safety. Fortunately there are solutions. Most, if not all, of these lighting problems can be easily managed with a lighting ordinance without adding additional costs to the property owner. For the property owner, it is just as easy and economical to install proper lighting fixtures, as it is to install improper lighting fixtures.

If the County wishes to prevent lighting problems from cropping up in the future, it must first provide clear and concise guidance that is integrated into the development process. Staff is not proposing something new; rather, we are recommending that the Zoning Ordinance include a section that clarifies the existing lighting standards and spells out the requirement for a lighting plan. Actually, developers already should be, in most cases, providing the County with lighting plans; however, there is no specific requirement in the Ordinance to do so. Currently, the County's Zoning Ordinance touches briefly on lighting and glare avoidance, but unfortunately stops there. Consequently, the County staff, especially during the process of development review, has little or no guidance on how to properly implement the performance standards in the Zoning Ordinance, especially at such a time when the County is at a critical juncture with many undeveloped commercial properties in the upper County. Therefore, as part of the Zoning Ordinance review project, staff decided that it was appropriate to prepare a draft lighting ordinance for your review. Several sources, including the Internet, were used to collect information regarding light pollution and lighting ordinances. Two major sources, however, provided excellent reference material: the Illuminating Engineering Society of North America (IESNA), and the International Dark Sky Association (IDA). The IDA is an astronomical society established to create awareness about the effects of light pollution. *In November of last year I attended a seminar on light pollution that was conducted by the IDA.* Both of these organizations provide solutions to communities, including model ordinances, on the subject of light pollution.

Background

Because each person most likely has a different perception of the meaning of light pollution, it may be helpful to give an explanation of the term. Light pollution is a generic term that encompasses many different aspects of improper lighting. The three major components of light pollution are light trespass, glare, and urban sky glow³. Light trespass is easily quantifiable as a measure of illuminance⁴ and is easily measured in the field by a standard light meter (light meters typically can be found at most camera shops). Light trespass is a term commonly used to describe the result of misdirected light; however, from a legal standpoint, light trespass is a nuisance and should be treated as

³ IES *Lighting for Exterior environments*, Illuminating Engineering Society of America, New York, March, 1999

⁴ Illuminance. The emitted or reflected light from a surface; relates directly to perceived "brightness." The unit of luminance is the candela per square meter (cd/m²).

such⁵. Glare, on the other hand, is the sensation produced by luminances⁶ within the visual field that is sufficiently greater than the luminance to which the eyes are adapted to thereby causing annoyance, discomfort, or loss in visual performance or visibility. Finally, the last component of light pollution, urban sky glow, is the result of stray light being scattered in the atmosphere thereby brightening the natural sky background level. As you might expect, light pollution is a serious issue and if left unchecked, has the potential to be an increasing problem in the County.

Unfortunately, a disturbing new trend seen lately in some national chains of convenience stores and gas stations has been to ratchet up the light level under the canopy to a very high level in an effort to attract customers and provide "a safer, more secure" environment for their employees. This has been a very serious problem for some Virginia localities. Rather than improve safety, these businesses have in fact compromised safety⁷. Poor quality light fixtures can give the illusion of safety or the feeling of security, but in reality they don't add to safety at all: they may actually make things worse⁸. Also, the glare associated with over-lighted sites actually reduces visibility on the site and leaves customers in a blinded state when exiting. But it's not just businesses that are contributing to the problem: residential security lights, floodlights, and signage all add to light pollution in a community. The following are issues associated with light pollution as stated by the International Dark Sky Association:

- ❑ Unshielded light shining into eyes reduces vision and is dangerous. A good light fixture shows you the scene, but can't be seen.
- ❑ Misdirected light shining into eyes, off property, or into the night sky is wasted electricity. That means higher electric bills and unnecessary air pollution.
- ❑ Misdirected light shining onto someone else's property is a nuisance. Too much light can create clutter, the visual equivalent of dueling boom boxes, and gives the community an industrial look.
- ❑ Excessively bright lighting makes it difficult to see into nearby darker areas. A highly illuminated background makes foreground objects turn into silhouettes. Eyes readjust slowly from bright light to lower light levels, temporarily diminishing vision.

⁵ *Good Neighbor/Outdoor Lighting*, New England Light Pollution Advisory Group and Sky Publishing Corp., 1998

⁶ Luminance. Commonly used in a qualitative or general sense to designate the act of illuminating or the state of being illuminated.

⁷ International Dark-Sky Association, Tuscon, AZ: "Why Should a City Government Be Concerned About Light Pollution?" No. 139, July, 1998 and "Service Station/Convenience Store Lighting." No. 145 December, 1998

⁸ International Dark-Sky Association, Tuscon, AZ: "Security lighting: Let's Have Real Security, Not Just Bad Lighting." No. 134 August, 1996

- ❑ An overly lighted business can be as intrusive as an oversized sign and creates a prison yard look.
- ❑ Light shining upward into the night sky destroys our view of half of our natural environment. Artificially brightened night skies diminish the usefulness of astronomical observatories and deprive us all of the calming and inspiring wonder of the heavens.

As most of you already know, a lot of above-mentioned problems currently exist in York County. However, staff believes that these problems can be well managed with a lighting ordinance.

The information provided here is simply a brief introduction to light pollution, its definition, and its many potential affects on a community. There is much more information on the subject than can be contained here. Staff encourages you to explore the web sites and resources listed at the end of the document to gain a greater understanding and appreciation for the issues.

Draft Lighting Ordinance

The goal of the lighting ordinance is to require responsible outdoor lighting to reduce the problems of glare and improve visibility, to minimize light trespass, to conserve energy, and to preserve the night skies. In effect, the lighting ordinance will ensure that property owners who use outdoor lighting provide only enough light for the task at hand, don't over-light, and don't spill light off their property. After conducting research on the subject matter, staff found that one of the easiest and inexpensive ways of controlling light pollution is to require the use of *full cutoff luminaires*⁹. Fully shielding all outdoor lighting fixtures with full cutoff luminaires will eliminate light trespass as well cut energy waste (see attached examples of full cutoff luminaires). The objective is to shield the light so that it goes down, not up or sideways. Because of improper lighting fixtures, a lot of lighting in the County is wasted and trespasses on adjacent properties. Full cutoff luminaire fixtures, however, will provide light only where it is needed and not on a neighbor's property. Property owners will benefit from energy cost savings and improved lighting and security.

Staff recommends requiring a full cutoff luminaire for those fixtures that have a light output of 3,000 initial lumens¹⁰. By establishing regulations that require full cutoff luminaires for lights that emit greater than 3,000 initial lumens, unwanted glare and light

⁹ Full Cutoff Luminaires. The term "full cutoff" means an outdoor light fixture shielded in such a manner that all light emitted by the fixture, either directly from the lamp or indirectly from the fixture, is projected below the horizontal plane.

¹⁰ Initial Lumens. Initial lumen is a measure of how much light the lamp is emitting near the beginning of its life.

pollution will be greatly reduced. This method greatly simplifies compliance determination. As a frame of reference, a common house security light has about 2,500 – 2,800 lumens. To prevent a situation where most residential properties would be covered by the new ordinance (because of home motion detectors, security lights, etc.), it was decided that 3,000 illumens would be a good cutoff point for requiring a full cutoff lighting fixture¹¹. Staff did not want to create a situation where residential properties were in non-compliance. It is important to note that in most cases, full cutoff luminares are no more expensive than any other lighting. In fact, streetlights, parking lot lights, and many other types of lighting designed as cutoff luminaires do not require separate shields or visors and cost about the same as non-cutoff types. In some cases, it's just a matter of the way the light fixture is designed or oriented. For example, for a business that utilizes a canopy, full cutoff lights can be designed so that they are recessed into the canopy rather than having lights protruding from underneath. This simple type of design improvement prevents misdirected light from spilling onto adjacent properties and reduces the store's "glow" effect. For others, the requirement of a full cutoff lighting simply means that the lighting would require a shield around the lighting fixture (see attached examples of full cutoff fixtures).

To get a better understanding of different regulatory alternatives, staff reviewed several lighting ordinances throughout Virginia and other parts of the U.S. that have adopted these types of ordinances. Staff paid particular attention to their potential effectiveness and ability to manage light pollution, as well as their ease of application and enforcement. In Virginia, the counties of Albermarle, Warren, Bedford, and Loudon all have adopted separate lighting ordinances. These localities use footcandles¹² or lumens¹³ as a way to measure light intensities. The Illuminating Engineering Society of North America (IESNA) establishes specific illumination standards depending on the particular light application. The IESNA publishes recommendations for the lighting industry that include illuminance levels for outdoor lighting. Most localities that have adopted lighting regulations require compliance with the recommendations made by the IESNA. We think these recommendations are safe and adequate and generally need not be exceeded. Increasing these established levels is usually a waste of energy, since our eyes quickly adjust and the brightness often appears to be about the same. Staff is considering a recommendation that the draft ordinance contain language requiring that lighting be consistent with the standards established by the IESNA.

11 The County of Albermarle uses a similar ordinance to reduce light pollution. After discussions with Albermarle staff and because of its ease of implementation, staff determined that this type of ordinance would be a good model for York County.

12 Footcandles. A unit of illuminance. One footcandle is one lumen per square foot (lm/ft²).

13 Lumen. A lumen is a unit of measure of the intensity of light produced by a lamp (bulb) as indicated by the manufacturer

Compliance with the proposed lighting ordinance will be simple. Lighting proposals will be examined during the site and subdivision plan review process. An applicant must submit a photometric plan of the lighting schemes that are proposed on a site. This type of plan is typically included along with the landscape plan. In addition, the applicant must submit information on the type of lights that are proposed, including information from the light bulb's manufacturer indicating the amount of initial lumens. The initial lumens will be used to determine whether or not a lighting fixture must be a full cutoff luminaire. Lighting that has an initial lumens output of over 3,000 will require a full cutoff luminaire fixture. Requiring a photometric plan as part of the overall development plan will not add additional review time to the plan review process. Small plan submissions that normally do not require full development plans will be exempt from the regulations. If the applicant can show evidence that all lighting meets the full cutoff criteria, a photometric plan will not be required. It is important to note that a lighting ordinance will not solve all the problems associated with light pollution in the County. However, what the ordinance will accomplish, as verified from those localities who have implemented similar ordinances, is bring about responsible lighting which is more efficient, does not trespass onto neighbor's property, and reduces glare thereby protecting the night sky.

A great deal of the information and literature used for the research and preparation of the draft lighting ordinance was obtained from the Internet. The following World Wide Web Sites provided general information regarding light pollution and the preparation of lighting ordinances.

Illuminating Engineering Society of North America

URL: <http://www.iesna.org>

International Dark-Sky Association

URL: <http://www.darksky.org>

New England Light Pollution Advisory Group

URL: <http://cfa-www.harvard.edu/cfa/ps/nelpag.html>

REFERENCES

Lighting for Parking Facilities, IES RP-20, Illuminating Engineering Society of North America, 1988

IES Lighting Handbook, 8th ed., Reference and Application, Illuminating Engineering Society of North America, New York, 1993.

NELPAG Circulars No. 2 to 11", New England Light Pollution Advisory Group, Cambridge, MA, December 1993 - February 1995.

Good Neighbor Outdoor Lighting, New England Light Pollution Advisory Group (NELPAG) and the International Dark-Sky Association (IDA), May 1995

IDA Information Sheets, International Dark-Sky Association, Tucson, AZ:

- "Why We Don't Like the 175 Watt Mercury Fixture", No. 3, December, 1989.
- "Operating Data and the Economics of Different Lamps", No. 4, January, 1990.
- "Sample Letter to Help build Awareness and Ask for Help", No. 22, January, 1990.
- "Economic Issues in Wasted and Inefficient Outdoor Lighting", No. 26, February, 1990.
- "An Introduction to Light Pollution", No. 28, February, 1990.
- "Some Lighting Myths" No. 42, April, 1998
- "Lighting and Crime", No. 51, April, 1992.
- "Efficient Outdoor Lighting", No. 52, April, 1992.
- "U.S. Department of Justice Study of Street Lighting and Crime", No. 63, January_1998
- "Exterior Lighting: Glare and Light Trespass", No. 76, September, 1993.
- "Security lighting: Let's Have Real Security, Not Just Bad Lighting", No. 134, August, 1996
- "Why Should a City Government Be Concerned About Light Pollution?",No.139, July, 1998
- "Service Station/Convenience Store Lighting." No. 145 December, 1998
- "What is a True "Full Cutoff" Outdoor Lighting Fixture?" No. 143, October, 1998

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Attachment